OCCASIONAL PAPERS

of the
MUSEUM OF NATURAL HISTORY
The University of Kansas
Lawrence, Kansas

NUMBER 149, PAGES 1–16 24 JUNE 1992

A New Species of *Odontostilbe* (Teleostei, Characidae) from the Uruguay Basin, with Comments on the Diagnostic Characters of the Genus

Jorge R. Casciotta[1, 2], Amalia M. Miquelarena[1] and Lucila Protogino[1]

ABSTRACT *Odontostilbe yatai*, a new species of cheirodontine characid fish, is described from the Uruguay Basin of Argentina and Brasil. The new species differs from its congeners by the following combinations of characters: 11–13 ventral procurrent caudal rays not exhibiting sexual dimorphism, 7 or 8 supraneurals, relatively low body height, 3 or 4 premaxillary teeth, and 24–27 anal rays. Reexamination of the currently accepted diagnostic characters for the genus *Odontostilbe* reveals that six of the seven characters show marked populational and individual variation and the seventh character is plesiomorphic. Therefore, the monophyly of the genus *Odontostilbe* currently is unsupported.

Key Words: *Odontostilbe yatai*, new species, Uruguay Basin, Argentina, Brasil.

The characid genus *Odontostilbe* is comprised of small fishes that have compressed, pluricuspid teeth. This genus contains about 19 nominal species that range from Venezuela (Géry, 1977) to the Santa Fe Province in Argentina (Beltzer and Oliveros, 1981). In Argentina, species of *Odontostilbe* (*O. microcephala*, *O. paraguayensis*, *O. piaba*, and *O. yatai* nov. sp.) occur only in the

[1]Instituto de Limnología "Dr. Raul A. Ringuelet" and Museo de La Plata, Paseo del Bosque s/n, 1900 La Plata, Argentina.

[2]Present address: Division of Ichthyology, Museum of Natural History, The University of Kansas, Lawrence, Kansas 66045–2454 USA.

 ISSN 0091–7958

Parano-Platense zoogeographic province (*sensu* Ringuelet, 1975).

Cope (1870) erected this genus for *O. fugitiva* because he considered, among other characters, the presence of a complete lateral line and only one row of teeth on each premaxilla to be distinctive. Géry (1972) redefined *Odontostilbe*, distinguishing it from *Cheirodon* by the presence of a complete lateral line. Fink and Weitzman (1974) considered these genera to be synonyms, because they found that in *C. affinis* and *C. dialepturus*, the completion or lack of completion of the lateral line varied intraspecifically. However, Géry (1977) maintained *Odontostilbe* as a valid genus, arguing that in order to synonymize them, it would be necessary to revise both *Odontostilbe* and *Cheirodon* and reexamine their respective type species. More recently, Uj (1987) revised the cheirodontines of Paraguay and redefined *Odontostilbe* and *Cheirodon*, restricting the latter to *C. galusdae*, *C. interruptus*, and *C. pisciculus* (type species). Herein, we describe a new species of *Odontostilbe* from the Uruguay Basin and discuss the evidence for the monophyly of the genus.

MATERIALS AND METHODS

Specimens examined.—*Cheirodon galusdae* Eigenmann: MLP 8942, 1♂, 1♀, 40.7–44.9 mm SL, Estero Perales, Chile, col.: E. de La Hoz, 1/1986, cleared-and-stained (C&S). *C. ibicuhiensis* Eigenmann: MCP uncat., 1♂, 1♀, 29.3–29.5 mm SL, Rio Ibicui, between São Rafael and Cacequi, RS, Brasil, col.: C. Lucena, L. Malabarba and R. Reis, 9/1983, (C&S). *C. interruptus* (Jenyns): MLP 8943, 2♂♂, 4♀♀, 2 juveniles, 28.0–38.0 mm SL, Arroyo Batel, Corrientes, Argentina, col.: J. R. Casciotta, 11/1983, (C&S). *C. pisciculus* Girard: MLP 8944, 2♀♀, 42.5, 48.0 mm SL, Estero Puange–Curacavi Chile, col.: Rebeca Aldunate M., 11/1983, (C&S). *Odontostilbe microcephala* Eigenmann: MLP 8945, 2♂♂, 3♀♀, 29.1–34.6 mm SL, Río Calera, Tucumán, Argentina, col.: R. C. Menni, H. L. López and J. R. Casciotta, 5/1980, (C&S). *O. paraguayensis* Eigenmann & Kennedy: MLP 8946, 3♂♂, 2♀♀, 29.2–35.3 mm SL, Riacho Carrizal, Río Paraná, Bella Vista, Corrientes, Argentina, col.: J. R. Casciotta, 11/1983, (C&S). *O. piaba*: MLP 8947, 4♂♂, 4♀♀, 26.2–27.0 mm SL, Riacho Carrizal, Río Paraná, Bella Vista, Corrientes, Argentina, col.: J. R. Casciotta, 11/1983, (C&S). *O. stenodon*: (Eigenmann) FMNH Z57865, holotype 25 mm SL, Bebedouro, Rio Grande, Brasil, col.: J. D. Haseman, 9/1908; FMNH Z57866, 20 paratypes 14.3–25.9 mm SL, same data as holotype.

Counts and measurements follow Vari and Géry (1980) and all measurements except standard length (SL) are expressed as a percentage of SL, unless otherwise indicated. Osteological material was cleared and stained with Alizarin Red S and Alcian Blue following both Hollister's (1934) and Dingerkus and Uhler's (1977) methods. Osteological drawings were pre-

pared with the aid of a Wild M5 stereomicroscope with camera lucida attachment.

Institutional acronymns follow Leviton et al. (1985).

Odontostilbe yatai nov. sp.

(Fig. 1, Table 1)

Holotype.—MLP 8726, ♂, 34.2 mm SL, Arroyo El Palmar, Paraje La Glorieta, Parque Nacional El Palmar, Entre Ríos, Argentina; col.: J. R. Casciotta, September 1982.

Paratypes.—MLP 8727, 14♂♂, 27.0–35.0 mm SL, and 10♀♀, 21.1–35.8 mm SL, with same data as holotype. MCP uncat. 1♂, 29.2 mm SL, and 1♀, 28.4 mm SL, with same data as holotype.

Additional material.—MLP 8948, 2♂♂and 1 juvenile 28.0–30.0 mm SL, same data as holotype. MCP 11288, 9♂♂, 26.1–34.0 mm SL, and 5♀♀ 29.1–34.7 mm SL; 1♂, 31.7 mm SL, and 1♀, 34.8 mm SL (C&S), Rio Santa Maria, ponte da Br. 293, trecho Dom Pedrito–Livramento, Km 245, RS, Brasil, col.: C. A. Lucena and L. Malabarba, October 1982.

Diagnosis.—*Odontostilbe yatai* differs from all other species in the genus by possessing the following combination of characters: (1) few ventral procurrent caudal rays (11–13, and not exhibiting sexual dimorphism); (2) 7 or 8 supraneurals; (3) relatively low body depth, (23.2–28.8% SL); (4) 3 or 4 premaxillary teeth; and (5) 24–27 anal rays.

Description.—Morphometric data from the holotype and paratypes appear in Table 1. Body slender in both sexes with greatest body depth at dorsal-fin origin. Dorsal profile from tip of snout to origin of dorsal caudal-fin lobe slightly convex, except for a small concave portion situated immediately posterior to supraoccipital crest. Ventral profile smoothly convex to pelvic-fin insertion in both sexes. Anal-fin base straight or slightly concave and equal in length in both sexes. Snout blunt; mouth terminal (holotype and some paratypes) or slightly prognathous. Maxilla long (29.8% head

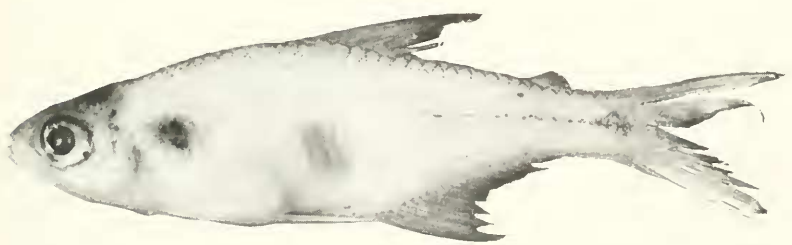

Fig. 1. *Odontostilbe yatai*, nov. sp. Lateral view of the holotype (MLP 8726, ♂, 34.2mm SL), from Paraje La Glorieta, Arroyo El Palmar, Parque Nacional El Palmar, Entre Ríos, Argentina. Scale bar = 5 mm.

Table 1. Morphometric data for *Odontostilbe yatai* nov. sp. Standard length in mm, other values given as percentage of standard length.

Measurement	Holotype	Paratypes: 14 males Mean	(Range)	Paratypes: 7 females Mean	(Range)
Standard length	34.2	30.6	(27.0–35.0)	28.1	(24.5–35.8)
Greatest depth	28.4	26.3	(24.4–28.3)	25.5	(23.2–28.8)
Snout to dorsal-fin origin	53.2	53.3	(49.6–57.1)	53.5	(51.1–56.9)
Snout to pelvic-fin origin	40.9	44.0	(41.1–46.1)	44.2	(39.3–48.0)
Snout to anal-fin origin	57.3	58.9	(53.4–64.4)	58.9	(58.0–61.5)
Snout to pectoral-fin origin	23.4	23.4	(21.7–25.0)	17.1	(15.7–18.7)
Least depth of caudal peduncle	10.5	9.7	(8.3–11.1)	8.8	(7.8–10.3)
Length of caudal peduncle	15.2	16.6	(13.8–18.5)	16.5	(13.7–18.9)
Pectoral-fin length	21.1	18.3	(16.9–19.9)	17.8	(16.2–19.4)
Pelvic-fin length	15.5	15.0	(14.0–16.0)	14.2	(11.9–15.8)
Length of anal fin base	26.6	26.3	(23.9–28.4)	26.3	(24.1–28.8)
Head length	22.5	23.2	(20.9–25.8)	23.6	(23.2–24.9)
Eye diameter	9.1	9.0	(8.3–9.7)	9.3	(8.8–9.8)
Snout length	6.1	6.1	(5.3–7.1)	5.6	(4.2–7.1)
Postorbital length	7.9	8.5	(6.9–9.8)	7.8	(7.0–9.0)
Interorbital width	6.7	6.4	(5.2–6.8)	5.7	(4.9–6.7)
Upper-jaw length	6.7	6.1	(5.3–6.7)	6.6	(5.6–7.5)

length in holotype, 23.1–28.0% in 10 paratypes). Posterior tip of maxilla extending to level of anterior border of eye. Eye diameter relatively large in proportion to head length (40.4% HL in holotype, 37.3–43.8% in 21 paratypes). Nostrils separated by flap of skin; posterior nostril longer than anterior.

Frontoparietal fontanelle extensive: parietals completely separate. Frontals in contact only at epiphyseal bar. Circumorbital series with 1 antorbital and 6 infraorbitals; third infraorbital largest and in contact with sensory canal of preopercle. Infraorbitals 5 and 6 represented only by a small part of infraorbital canal. Seven or eight supraneurals (Fig. 2A).

Teeth in single row in each jaw. Premaxilla (Fig. 3B) small with short ascending process and 3 or 4 teeth; each tooth bearing 6 or 7 cusps, a marked neck, and distal expansion. Maxilla (Fig. 3A) elongate with 2 or 3 fully erupted, functional teeth. Dentary long (Fig. 3C); from dental symphysis to posteroventral border, slightly more than five times length of premaxilla. Dentary with 6 teeth; anterior three teeth with 4–7 cusps; fourth tooth tricuspid and two most posterior teeth unicuspid.

Vertebrae 32 or 33 (3 specimens cleared-and-stained), including Preural Centrum 1, and excluding Weberian apparatus.

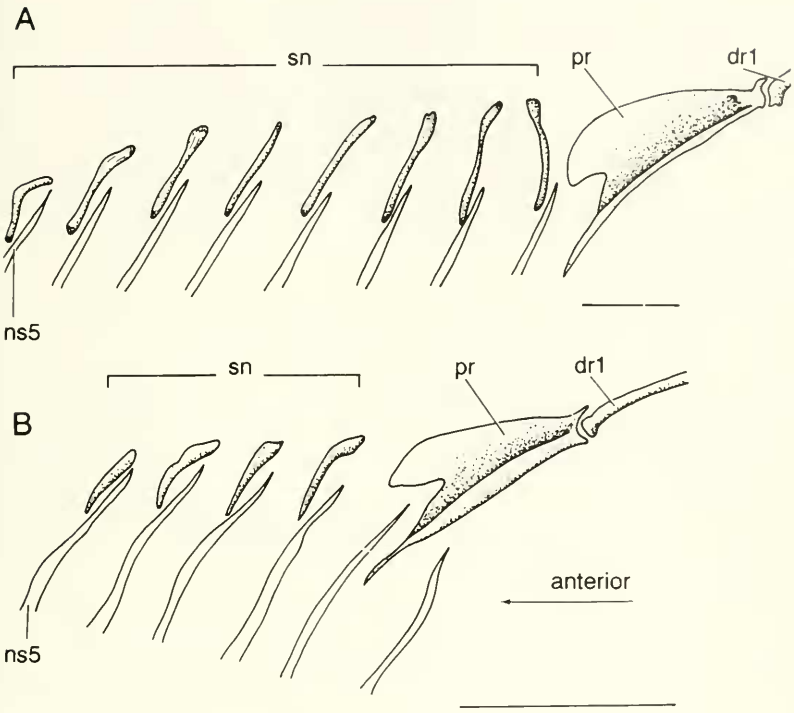

Fig. 2. Supraneural region in left lateral view. A. *Odontostilbe yatai*, nov. sp., ♂ (MLP 8948). B. *Odontostilbe piaba*, ♂ (MLP 8947). Abbreviations: dr 1 = first dorsal ray; ns 5 = 5th neural spine; pr = proximal radial; sn = supraneurals. Scale bar = 1 mm.

Dorsal fin pointed, anterior rays longest, 2i + 8 + i (holotype), 2i + 9 (2 paratypes), 3i + 7 + i (1 paratype), 3i + 8 + i (2 paratypes), 3i + 8i (7 paratypes), 3i + 9 (9 paratypes). Anal fin emarginate, 4i + 20 (1 paratype), 4i + 20 + i (1 paratype), 4i + 21 (4 paratypes), 4i + 22 (3 paratypes), 5i + 20 (2 paratypes), 5i + 20 + i (1 paratype), 5i + 21 (4 paratypes), 5i + 21 + i (1 paratype), 5i + 22 (holotype and 4 paratypes). Anal fin in males with bony hooks on posterior face of the last anterior unbranched ray and first seven to eleven branched rays (Fig. 4A). Hooks most strongly developed on segments of branched rays 2–6. Pectoral fin pointed, third ray longest, reaching origin of pelvic fin. Pectoral fin, i + 9 (1 paratype), i + 9 + i (holotype and 2 paratypes), i + 10 (4 paratypes), i + 10 + i (2 paratypes), i + 11 (1 paratype), 2i + 8 (3 paratypes), 2i + 9 (5 paratypes), and 2i + 10 (1 paratype). Pelvic fin pointed, reaching anal-fin origin and bearing numerous bony hooks in males (Fig. 5). Pelvic fin, i + 7 in holotype and nine paratypes. Caudal fin (Fig. 6A), emarginate without sexual dimorphism.

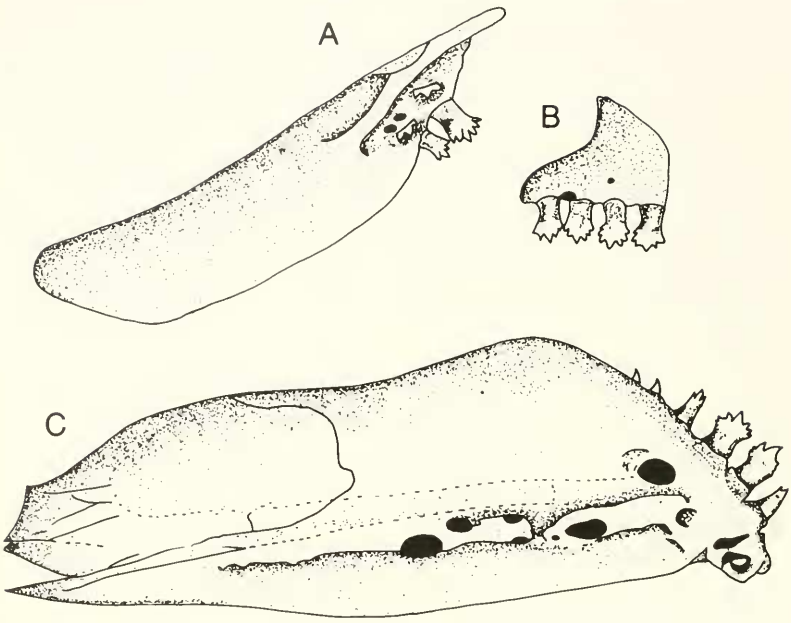

Fig. 3. *Odontostilbe yatai*, nov. sp., ♂ (MLP 8948), right lateral views of maxilla (A), premaxilla (B), and lower jaw (C). Scale bar = 1 mm.

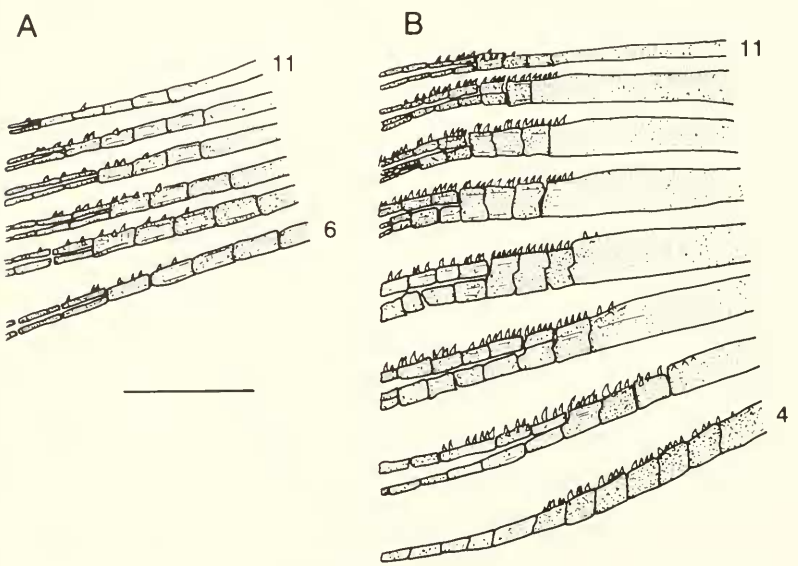

Fig. 4. Anal-fin rays in right lateral view, showing the bony hooks. A. *Odontostilbe yatai* nov. sp., ♂ (MLP 8948). B. *Odontostilbe piaba*, ♂ (MLP 8947). Scale bar = 1 mm.

Principal caudal-fin rays 19 (10/9); procurrent caudal-fin rays 13/11–13.

Scales cycloid, thin. Scales in longitudinal series 28 (1 paratype), 30 (2 paratypes), 31 (4 paratypes), 32 (3 paratypes), 33 (6 paratypes), 34 (holotype and 4 paratypes); with 4–9 perforated lateral-line scales. Transverse scales from dorsal-fin origin to anal-fin origin 8–10 (holotype and 19 paratypes). Scales not extending onto caudal fin.

Color in alcohol.—Overall color pattern reminiscent of *Cheirodon mitopterus* from Panama (Fink and Weitzman, 1974). Ground color light creamy-brown. Small melanophores present on dorsum of head, snout, premaxilla, and tip of dentary. Small melanophores also present on scale margins of back; more numerous dorsally, forming reticulate pattern above midline. Midline with groups of melanophores forming diffuse lateral stripe internal to the scales. Scattered melanophores between anal-fin base and midline, following myosepta. Caudal spot present as elongate oval area of dense melanophores extending onto middle caudal-fin rays. Melanophores present along first ray of pectoral fins. Pelvic fin clear. Dorsal, anal, and caudal fins with small melanophores along fin rays and interradial membranes.

Geographic distribution (Fig. 7).—This species is known exclusively from Arroyo El Palmar, Entre Ríos, Argentina, and from Rio Santa Maria, ponte da BR. 293, trecho Dom Pedrito–Livramento Km 245, Rio Grande do Sul, Brasil.

Etymology.—The name *yatai* is derived from the Guaraní word meaning palm tree and refers to *Butia yatay*, a palm tree dominant at the type locality.

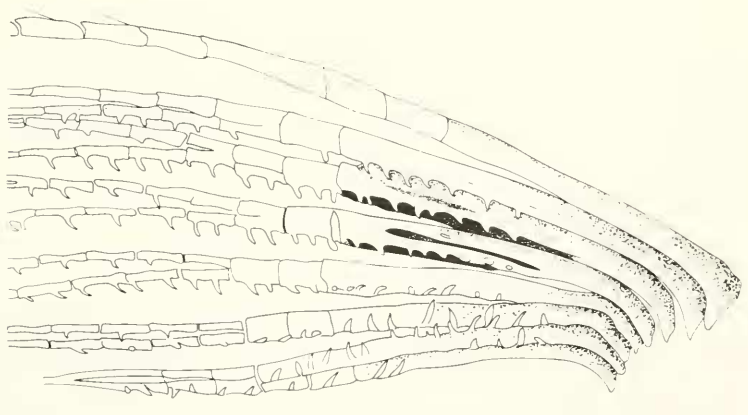

Fig. 5. *Odontostilbe yatai* nov. sp., ♂ (MLP 8948), right pelvic-fin rays in ventromedial view. Dashed line indicates midline of body. Scale bar = 1 mm.

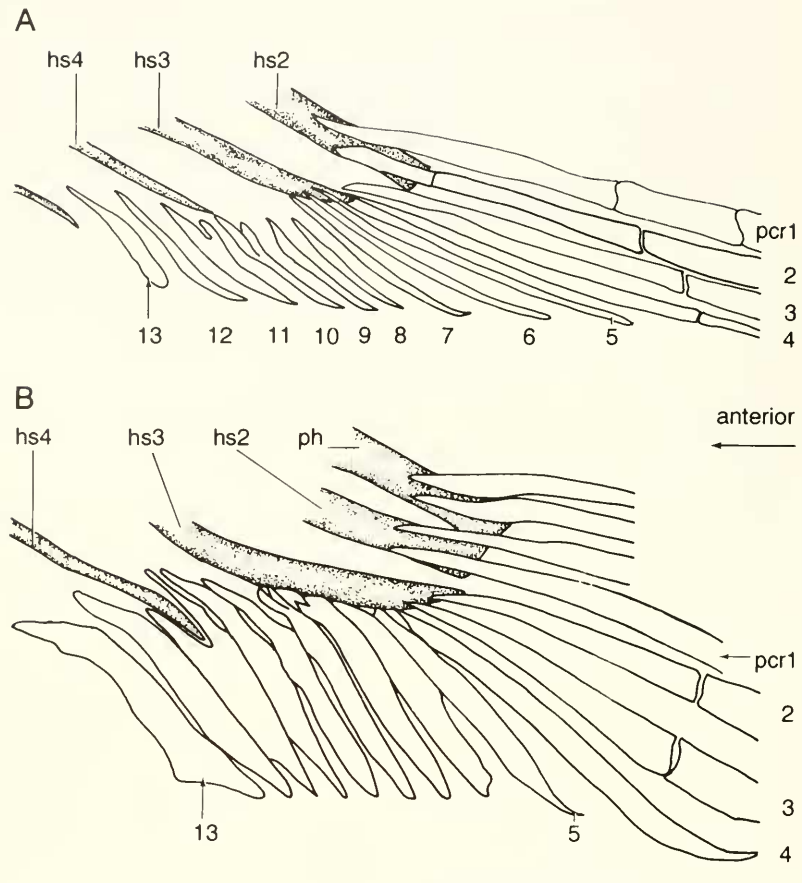

Fig. 6. Ventral procurrent caudal rays. A. *Odontostilbe yatai*, nov. sp., ♂(MLP 8948). B. *Odontostilbe piaba* (MLP 8947). Abbreviations: hs 2–5 = 2nd to 5th haemal spines; ph = parahypural; pcr 1–13 = ventral procurrent caudal rays 1–13. Scale bar = 1 mm.

DISCUSSION

According to Géry (1977), *O. yatai* is a member of the "*piaba* group" characterized by "teeth broad, expanded at tip, the broadest with 7–12 cusps; 8–13 (rarely 14) interhaemals." The *piaba* group consists of *Cheirodon madeirae*, *C. gracilis*, *C. felipponei*, *Odontostilbe kriegi*, *O. piaba*, and *O. notomelas*. *Odontostilbe yatai* is distinguished from *Cheirodon madeirae* and *O. notomelas* because both of the latter species possess a large caudal spot. It differs from *O. kriegi* in having a fewer

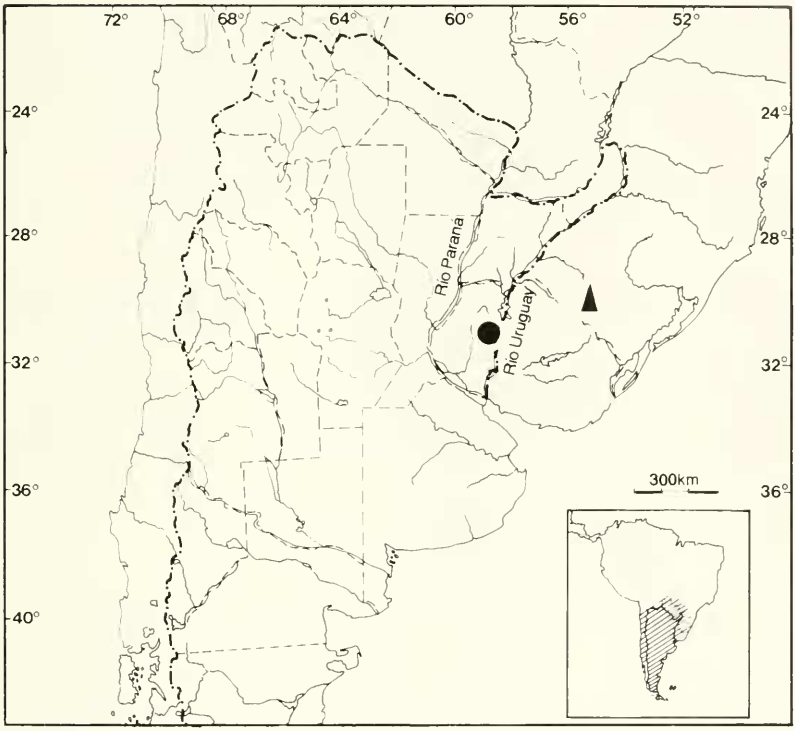

Fig. 7. Geographic distribution of *Odontostilbe yatai* nov. sp. in southern South America. Circle indicates type locality: Paraje La Glorieta, Arroyo El Palmar, Parque Nacional El Palmar, Entre Ríos, Argentina. Triangle indicates Rio Santa Maria, Ponte da BR 293, trecho Dom Pedrito–Livramento, Km 245, RS, Brasil.

premaxillary teeth (3 or 4 vs. 5) and from *C. gracilis* in having fewer tooth cusps, (6 or 7 vs. 10 or 12). *Odontostilbe yatai* can be distinguished from *C. felipponei* by the greater number of anal rays (24–27 vs. 19) and from the most common *Odontostilbe* in the region, *O. piaba,* by following characters. (1) *Odontostilbe yatai* lacks sexual dimorphism in the caudal fin (Fig. 6A); but *O. piaba* show marked sexual dimorphism, where males (Fig. 6B) bear stout ventral procurrent caudal-fin rays that are short, wide, and close to one another. (2) The anal fin in male *O. yatai* has fewer bony hooks on each fin ray (Fig. 4A, B). (3) *Odontostilbe yatai* possesses more supraneurals—i.e., seven or eight rather than four (Fig. 2A, B). (4) In *O. yatai,* there are fewer premaxillary teeth (3 or 4 vs. 5) and fewer cusps on the teeth (6 or 7 vs.7–9). (5) The dentary is about five times as long as the premaxilla in *O. yatai,* whereas it is only two and one-half times as long as the premaxilla in *O. piaba.* (6) *Odontostilbe yatai* has more vertebrae than

O. piaba (32 or 33 vs. 28 or 29). (7) In *O. yatai*, the maxilla is relatively long and slender. (8) Last, the body depth of *O. yatai* is relatively more shallow than that of *O. piaba*. Outside the *piaba* group, *O. yatai* is distinguished from *O. stenodon* by having three or four premaxillary teeth instead of five. With respect to the remaining Argentinean species of *Odontostilbe*, *O. yatai* differs from *O. paraguayensis* by lacking fused supraneurals and from *O. microcephala* by bearing fewer premaxillary teeth (3 or 4, vs. 5 or 6).

Uj (1987) used seven osteological characters to distinguish *Cheirodon* and *Odontostilbe*. For *Cheirodon* and *Odontostilbe*, respectively, the characters are as follow: (1) Orbitosphenoid stout vs. gracile; (2) rhinosphenoid reduced vs. well developed; (3) parietal branch of supratemporal canal not in contact with the parietal branch of the supraorbital canal vs. in contact; (4) parietal branch of supraorbital canal lacking an inferior branch oriented towards pterotic vs. possessing an inferior branch; (5) presence of a small process on the pterotic vs. absence of this process; (6) base of postcleithrum 3 with a posterior bony expansion vs. absence of an expansion; and (7) ventral procurrent rays of males with a well-developed keel vs. unkeeled.

Study of these characters in several species of *Cheirodon* and *Odontostilbe* reveals that the first six characters vary markedly within species (Tables 2–4), as well as within individual specimens (Tables 5–7). Most species of *Cheirodon* have stout orbitosphenoids as noted by Uj (1987), but within *Odontostilbe*, we found species that exhibit all three states—i.e., gracile, intermediate, and stout (Table 2). To a lesser degree, the same kind of variation is evident for the four states of the rhinosphenoid character (Table 3); because variation in this character is relatively rare (<10%), some systematists may not consider it troubling. Character 3

Table 2. Distribution of variation observed for Uj's (1987) orbitosphenoid character (shape of the orbitosphenoid). Note that the variation in this character can be expressed in three character states for species of *Cheirodon* and *Odontostilbe*. Number of specimens in parentheses. + = presence and – = absence.

Species	Orbitosphenoid shape		
	Gracile	Intermediate	Stout
C. galusdae	–	–	+ (2)
C. ibicuhiensis	–	–	+ (2)
C. interruptus	–	+ (2)	+ (4)
C. pisciculus	–	–	+ (2)
O. microcephala	+ (5)	–	–
O. paraguayensis	+ (5)	–	–
O. piaba	+ (1)	+ (1)	+ (6)
O. yatai	+ (2)	+ (1)	+ (1)

Table 3. Distribution of variation observed for Uj's rhinosphenoid character (development of rhinosphenoid). Note that variation in this character can be expressed in four character states for species of *Cheirodon* and *Odontostilbe*. Number of specimens in parentheses. + = presence and – = absence.

Species	Development of rhinosphenoid			
	Absent	Reduced	Intermediate	Well-developed
C. galusdae	–	+ (2)	–	–
C. ibicuhiensis	–	+ (2)	–	–
C. interruptus	–	+ (7)	–	–
C. pisciculus	–	+ (2)	–	–
O. microcephala	+ (2)	–	–	+ (3)
O. paraguayensis	–	–	–	+ (5)
O. piaba	–	–	+ (1)	+ (7)
O. yatai	–	–	–	+ (1)

(noncontact vs. contact of parietal branch of supratemporal canal with the parietal branch of the supraorbital canal; Fig. 8) showed marked interspecific variation in *Odontostilbe* (Table 4); thus, in about half the specimens, the branch is in contact, whereas in the remaining it is not. In contrast, within *Cheirodon*, only one individual of *C. galusdae* has the character state (branch in contact). Character 5 (presence vs. absence of a small

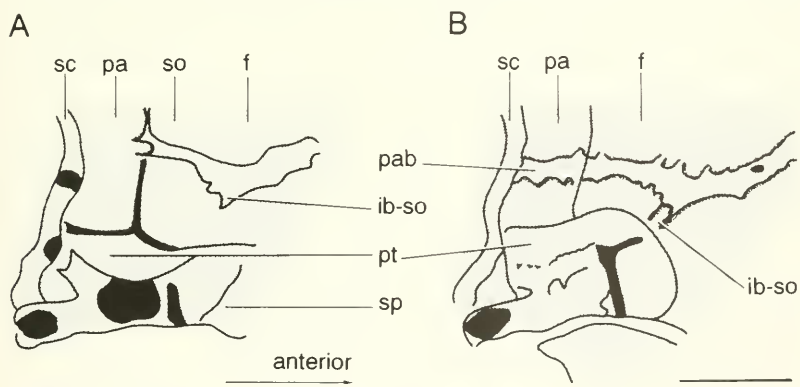

Fig. 8. Posterodorsal region of the right side of skull in lateral view. A. *Odontostilbe yatai* nov. sp., ♂ (MLP 8948), showing lack of contact between the supraorbital canal and the supratemporal canal and limited development of the lower branch of the supraorbital canal. B. *Cheirodon interruptus*, ♂ (MLP 8942), showing the parietal branch of the supraorbital canal in contact with the supratemporal canal and the development of the lower branch of the supraorbital canal. (Note the lack of process on the pterotic [*sensu* Uj, 1987]). Abbreviations: f = frontal; ib-so = inferior branch of the supraorbital canal; pa = parietal bone; pab = parietal branch of supraorbital canal; pt = pterotic; sc = supratemporal canal; so = supraorbital canal; sp = sphenotic. Scale bar = 1mm.

Table 4. Distribution of variation observed for Uj's (1987) parietal branch contact character (parietal branches of supratemporal canal not in contact with the parietal branch of the supraorbital canal, or in contact) for species of *Cheirodon* and *Odontostilbe*. Number of specimens in parentheses. + = presence and – = absence.

	Parietal branches of supratemporal and supraorbital canals		
Species	Not in contact on both sides	In contact on both sides	In contact only on one side
C. galusdae	+ (1)	+ (1)	–
C. ibicuhiensis	+ (2)	–	–
C. interruptus	+ (7)	–	–
C. pisciculus	+ (2)	–	–
O. microcephala	–	+ (5)	–
O. paraguayensis	–	+ (5)	–
O. piaba	+ (6)	+ (1)	+ (1)
O. yatai	+ (5)	–	–

process on the pterotic) also varies intraspecifically (Table 6). With respect to Character 4 (presence or absence of inferior branch of parietal branch of supraorbital canal; Table 5), most of the species of both genera have an inferior parietal branch; whereas we found the branch present in *Cheirodon*, Uj (1987) did not. Character 6 (presence or absence of a posterior, bony expansion at the base of postcleithrum 3; Table 7; Fig. 9) is similar to Character 4, but in this case, it was reported to be absent in *Odontostilbe* by

Table 5. Distribution of variation observed for Uj's (1987) inferior parietal branch character (parietal branch of supraorbital canal with or without an inferior branch oriented towards pterotic) for species of *Cheirodon* and *Odontostilbe*. Number of specimens in parentheses. + = presence and – = absence.

	Inferior branch of parietal branch of supraorbital canal		
Species	With branch on both sides	Without branch on both sides	With branch only on one side
C. galusdae	+ (2)	–	–
C. ibicuhiensis	+ (2)	–	–
C. interruptus	+ (5)	–	–
C. pisciculus	+ (2)	–	–
O. microcephala	+ (5)	–	–
O. paraguayensis	+ (5)	–	–
O. piaba	+ (6)	–	+ (1)
O. yatai	+ (2)	+ (3)	–

Table 6. Distribution of variation observed for Uj's (1987) pterotic process character (presence or absence of a small process on the pterotic) for species of *Cheirodon* and *Odontostilbe*. Number of specimens in parentheses. + = presence and – = absence.

Species	Pterotic process		
	With process on both sides	Without process on both sides	With process only on one side
C. galusdae	+ (2)	–	–
C. ibicuhiensis	+ (2)	–	–
C. interruptus	–	+ (5)	+ (1)
C. pisciculus	+ (1)	+ (1)	–
O. microcephala	+ (2)	+ (1)	+ (2)
O. paraguayensis	+ (1)	+ (3)	+ (1)
O. piaba	–	+ (6)	+ (2)
O. yatai	–	+ (5)	–

Uj (1987), whereas we found it present. For these reasons we consider Characters 1–6 to be inappropriate as diagnostic features.

Uj's (1987) Character 7 does not vary intraspecifically or individually; thus, it can be used to distinguish species of *Odontostilbe* and *Cheirodon*. This character was analyzed in detail by Arratia (1987) and on the basis of her study and our data, we consider it synapomorphic for the genus *Cheirodon*. Based on the unique presence of strongly keeled ventral

Table 7. Distribution of variation observed for Uj's (1987) postcleithrum character (presence or absence of a posterior bony expansion at base of Postcleithrum 3) for species of *Cheirodon* and *Odontostilbe*. Number of specimens in parentheses. + = presence and – = absence.

Species	Bony expansion at base of postcleithrum 3		
	With bony sheet on both sides	Without bony sheet on both sides	With bony sheet only on one side
C. galusdae	+ (2)	–	–
C. ibicuhiensis	+ (2)	–	–
C. interruptus	+ (6)	–	+ (1)
C. pisciculus	+ (2)	–	–
O. microcephala	+ (3)	–	–
O. paraguayensis	+ (5)	–	–
O. piaba	+ (7)	–	–
O. yatai	+ (4)	+ (1)	–

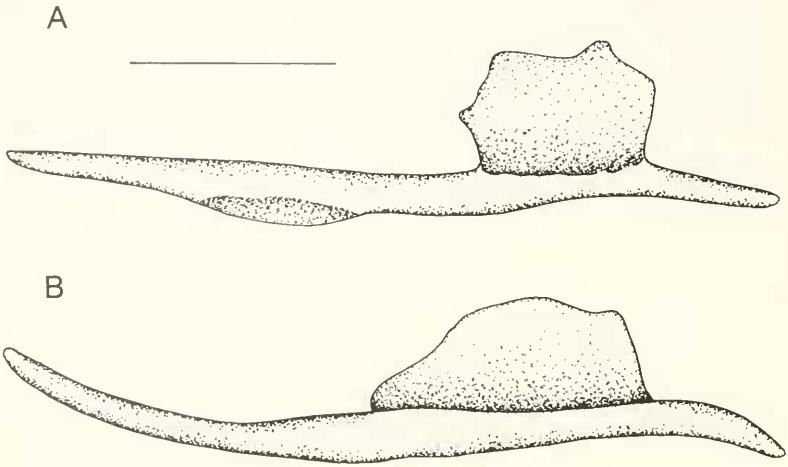

Fig. 9. Postcleithrum 3 (left) with a posterior membranous bony expansion in lateral view. A. *Odontostilbe piaba*. (MLP 8947). B. *Odontostilbe yatai* nov. sp. (MLP 8948). Scale bar = 0.5 mm.

procurrent rays in males, *Cheirodon* is restricted to *C. australe*, *C. galusdae*, *C. ibicuhiensis*, *C. interruptus*, and *C. pisciculus*.

As a result of this study, the monophyly of *Odontostilbe* (*sensu* Uj, 1987) is supported by six characters that vary among individuals and one plesiomorphic character (ventral procurrent rays in males without a keel). Although the genus should be diagnosed on the basis of unique shared-derived characters that do not vary intraspecifically, such a study is beyond the scope of this paper.

KEY TO THE SPECIES OF *ODONTOSTILBE* COPE FROM ARGENTINA

1. Supraneurals fused ..... *O. paraguayensis*
1a. Supraneurals not fused 2

2. 7–8 supraneurals; premaxilla with 3 or 4 teeth ..... *O. yatai*
2a. 4 supraneurals; premaxilla with 5 or 6 teeth 3

3. 13–15 ventral procurrent rays with marked sexual dimorphism in terms of their stoutness; greatest body depth 2.2–3.0 in SL. ..... *O. piaba*
3a. 9–11 ventral procurrent rays without sexual dimorphism; greatest body depth 3.8–4.0 in SL ..... *O. microcephala*

Acknowledgments: We thank the authorities of Parques Nacionales, Argentina, for their permission to collect in the "El Palmar" National Park, Provincia de Entre Ríos. We are indebted to B. Chernoff (Field Museum of Natural History, Chicago, USA), R. Aldunate (Laboratorio de Zoología, Universidad Católica de Valparaiso, Chile), and L. Malabarba (Museum de Ciencias da Pontificia Universidade Catolica do Rio Grande Do Sul, Brasil) for the loan or gift of material. We would like to express our gratitude to S. Weitzman (Smithsonian Institution, Washington, D.C.), and G. Arratia (Museum of Natural History, The University of Kansas, Lawrence) for their critical reviews of the manuscript, Kate Shaw (Museum of Natural History, The University of Kansas) for her editorial suggestions, A. C. Tremouilles (Museo de La Plata), who completed the final drafts of the figures, and E.O. Wiley and the Division of Fishes (Museum of Natural History, The University of Kansas) for financial support in conjuction with the production of PMTs. The first author is a member of the Comisión de Investigación Científica de la Provincia de Buenos Aires, Argentina. Part of this research was supported by a fellowship from CONICET, Argentina, at the Museo de La Plata and Instituto de Limnología "Dr. Raul A. Ringuelet" (Argentina) and at the Museum of Natural History, The University of Kansas (USA).

LITERATURE CITED

Arratia, G. 1987. Sexual dimorphism in the caudal skeleton of *Cheirodon* (Characidae, Teleostei). Cybium 11(4):375–387.

Beltzer, A.H., and O.B. Oliveros. 1981. Alimentación de aves en el valle aluvial del Río Paraná medio II. *Egretta alba egretta* (Gmelin, 1789) y *Egretta thula thula* (Molina, 1782) Ciconiiformes, Ardeidae). Ecologia 6:119–124.

Cope, E.D. 1870. Contribution to the ichthyology of the Marañon. Proc. Am. Philos. Soc. 11:559–570.

Dingerkus, G., and L.D. Uhler. 1977. Enzyme clearing of Alcian blue stained whole small vertebrates for demonstration of cartilage. Stain Technol. 52:229–232.

Fink, W.L., and S.H. Weitzman. 1974. The so-called cheirodontin fishes of Central America with descriptions of two new species (Pisces: Characidae). Smithsonian Contrib. Zool. 172:1–46.

Géry, J. 1972. Contribution a l'etude de poissons characoids de l'Equateur. Acta Humboltiana, ser. Geol., Paleontol. Biol. 2:1–110, Plates i–vii.

Géry, J. 1977. *Characoids of the World*. New Jersey: T.F.H. Publications, Inc.

Hollister, G. 1934. Clearing and dyeing fish for bone study. Zool. N.Y. 13:81–101.

Leviton, A.E., R.H. Gibbs, Jr., E. Heal, and C.E. Dawson. 1985. Standards in herpetology and ichthyology: Part I. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. Copeia 1985(3):802–832.

Ringuelet, R.A. 1975. Zoogeografía y ecología de los peces de aguas continentales de la Argentina y consideraciones sobre las áreas ictiológicas de América del Sur. Ecosur (3):1–151.

Uj, A. 1987. Les Cheirodontine (Characidae, Ostariophysi) du Paraguay. Rev. suisse Zool. 94:129–175.

Vari, R.P., and J. Géry. 1980. *Cheirodon ortegai* a new markedly sexually dimorphic cheirodontine (Pisces: Characoidei) from the Río Ucayali of Perú. Proc. Biol. Soc.Wash., (1):75–92.